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Horticultural Education.

IN a recent number of this journal it was held that the study of horticulture and agriculture in their scientific aspects has a distinct value as a factor in furnishing exercise for certain powers of the mind. Every one admits that the natural sciences should have a place in the curriculum of colleges and schools as elements of wholesome intellectual development, if for no other reason; and, perhaps, no science furnishes better mental training and exercise than agriculture and horticulture when their principles are systematically studied. This does not imply that there should be no such a thing as direct technical training in horticulture and agriculture as arts, but the fact should be emphasized that the mental exercise and discipline furnished by horticultural education in its broad sense is equal, and perhaps superior, to that furnished by the study of any other science. No kind of mental application will be more effectual in forming habits of careful observation and comparison and in securing those orderly methods of thinking which are of the greatest use in the examination of many of the problems which confront us in our daily life.

In an article in a recent number of *Science* on Horticulture at Cornell, we are glad to see that this view is set forth with considerable fullness by Professor Bailey, who contends that horticulture as studied at that university is capable of adding much to the value of a course of liberal academic training. Professor Bailey illustrates the merits of horticulture as a science by showing some of its uses and applications in discussing the theory of evolution, which is perhaps now the most important conception with which the thinking world has to deal. In supporting the hypothesis of evolution, horticulture shows the development of life in actual operation. More than six thousand species of plants are cultivated, and most of these have been broken up into varied forms by the touch of man. Some species have produced thousands of distinct forms, and the methods of the production of many of them are on record. In place of arguments as to the probable influence of climate upon plants the horticulturist cites definite cases, so that there is no conjecture about the matter. Instead of speculating upon the transmission of acquired characters the horticulturist furnishes proofs of such transmission. Palæontology brings disjointed evidence in regard to the influence of selection and probable changes from environment, while the horticulturist brings examples before our eyes to prove that he can modify and mould vegetation at his will. The horticulturist creates new species and shows you numbers of cultivated plants of which no one knows the original form, because the ones with which we are acquainted are so unlike the type that the two can never be connected. This is only a single line of inquiry, and other illustrations quite as striking can be given to show that there is an abundant field for scientific research and profound thought in horticultural science as such.

The value of agricultural colleges as training schools for those whose purpose it is to practice agriculture and horticulture is conceded, and there is no question that they have been very helpful in making expert farmers and gardeners, in increasing the products and profits of cultivation and in improving the conditions of rural life. But, aside from the strictly educational value of the broader way of studying the science of crops, it must be remembered that this scheme of instruction has also its immediate practical value. The student who masters principles is more thoroughly equipped than one who only learns rules. Of course, it requires a somewhat mature mind to grasp the scientific laws on which the practice of horticulture is based, but when once this is accomplished the student can make his own applications, and he is not only less liable to make mistakes than one who is generally ignorant of the principles upon which his practice is founded, but he will constantly be stimulated to use his mind rather than his hands, and to get that enthusiasm for rural life which is essential to the highest success. Horticultural and agricultural education, as distinct from mere training, is not always possible, but where the course covers several years this broader method is certainly preferable, and this not only because it insures better practice in the rural arts, but because, as a part of a general education, it makes more capable and self-reliant men and women.

In reference to the methods at Cornell, Professor Bailey says:

> The teaching there aims not so much to make farmers as to educate farmers' sons and daughters. Its fundamental idea is to give those students who anticipate a rural life such a breadth of training as will put them in touch and sympathy with the traditions of education, with all the larger movements of the day, and enable them at the same time to understand the fundamental reasons of their own occupation. There is less attempt to apply this teaching upon the university farm than there is to instill the desire to master the underlying principles of horticulture. Teaching is done by class exercises and by laboratory work, as it is in other scientific and technical subjects at the present day. If the student hears a lecture on the rotation of crops he goes for a walk with the professor over the fields of the farm and the adjoining lands and there observes the good and bad points of farm management. If he hears a lecture upon Winter Tomatoes he also goes with the instructor or alone, or from day to day, and studies the Tomatoes as they grow under glass. Besides this, he has his mind opened by thinking upon economics, language, history and general science as much as upon some of the particular subjects with which he is to deal in a more intimate way. The student should be a citizen before he is a farmer.

Our great progress in the mechanic arts is due to the application of science to the various branches of manufacture in cheapening processes, making them more effectual and utilizing by-products. The arts of agriculture and horticulture have the same need of science, and advancement in either of them must be in the same direction. Unlike manufacturing industries, however, which are mainly carried on by large forces of men under a single directing head, the work of agriculture is scattered over thousands of farms. The number of men superintending these operations—that is, of men who must rely upon their own knowledge—are in much larger proportion to the mere laborers than are the skilled superintendents in the field of manufactures. For this reason there is no class of persons, taken as a whole, who stand in greater need of such an education as will enable them to conduct their work with

intelligence. The experiment stations are doing much for cultivators of the soil by publishing the results of scientific research and making experiments which are too costly for farmers to carry out. But the hope of agriculture in the future in this country must rest, after all, on a wider system of education. The rural industries will prosper just as the whole rural population becomes more enlightened and are enabled to bring to their daily work minds drilled and equipped for active thinking as well as muscles trained and strengthened for expert handiwork.

The latest and forty-eighth volume of *The Garden* is dedicated to George Nicholson, curator of the Royal Gardens at Kew, for his work among trees and shrubs. In his dedication the editor takes occasion to state that "we do but express the general feeling of the horticultural world toward the important national establishment of which Mr. Nicholson is the distinguished practical head. We recognize with considerable pleasure the great improvement in the present cultivation and disposition of the collections at Kew compared with past times, an improvement due to the proper recognition of the general desire to see picturesque and artistic gardening in the nation's own garden as well as the purely botanical. We believe this has been accomplished without any loss on the botanical side; indeed, we learn that the collections are now much richer in species, as well as in botanical interest, than ever they were. Every gardener is grateful for this improvement at Kew which we owe to the present staff of which Mr. Nicholson is a distinguished member, having been appointed curator at the same time as Mr. T. Thiselton Dyer was appointed director on the retirement of Sir Joseph Hooker in 1886." In this country Mr. Nicholson is well known as editor of the useful *Dictionary of Gardening*. In 1893 he visited the United States as a judge in the Horticultural Department of the Chicago Exposition and made many friends here.

Early Experiments in Crossing Plants.

In the reference to Thomas Andrew Knight and his work in Garden and Forest of December 25th, p. 512, a statement is made from which a wrong conclusion may be drawn. Professor Bailey is reported as saying: "He was the first man, so far as I know, who advised the use of cross-fertilization for the purpose of producing new varieties and for the purpose of improving existing ones. A similar work was taken up by Darwin." The emphasis may be on Knight's important work in experimenting with varieties which already existed rather than in the production of new varieties by the crossing of species. But the coupling of the name with that of Darwin seems to refer to cross-fertilization in general, for Darwin experimented both with species and varieties. Possibly a distinction is made between a hybrid, between different species and a cross between different varieties, but this is scarcely valid on the scientific side. Nägeli has said of it: "This distinction may sometimes serve a practical purpose, but is frequently confusing and deceptive, for it supposes a difference that is merely one of degree."* However this may be, Köhlreuter, an earlier experimenter than Knight, also used varieties as well as species in his extended investigations on cross-fertilization, and so anticipated Knight in this respect also. His object differed from Knight's, for it was to prove the sexual nature of plants, a question about which botanists were still contending. Like Darwin's experiments in cross-fertilizing plants to prove his theory of the origin of species, Köhlreuter's work was almost purely scientific in its aim, but he was a pioneer in what has proved of immense practical benefit. Some account of his earliest work, and that of Linnæus, along similar lines, may be of interest.

Köhlreuter was a Swabian, born at Sulz, on the Necker, where he produced his first hybrid plant in 1760. In 1764 he was made Professor of Natural History in Carlsruhe, a chair which he held till his death in 1806. Detailed accounts of his earliest work were published at Leipsic at different times from 1761 to 1766.† The results of subsequent experiments appeared in the *Transactions of the Imperial Academy of Sciences of St. Petersburg*. Like the work of Conrad Sprengel on the agency of insects in fertilizing flowers—in which he was anticipated by Köhlreuter—published in 1793, his experiments for a time passed out of sight or attracted but slight attention. The revived interest in the subject from the labors of Knight and Herbert in England, Gaertner and Wiegman in Germany, Godron in France, not to mention others, called attention to them once more. Knight's efforts to improve fruits and vegetables, which began about 1787, were evidently made in ignorance of what Köhlreuter had done, and his discoveries were to that extent independent. So scholarly a man as the Rev. William Herbert, who did much splendid work in crossing plants, says that he began his investigations "ignorant of the experiments of Köhlreuter." He gave the first account of his investigations before the Horticultural Society of London in 1819.‡ Köhlreuter's work, being purely scientific in its character, did not enlist the coöperation of horticulturists like the later work of Knight and Herbert, which had, or was soon given, a practical bearing. Botanists, being mostly devoted to systematic botany, were indifferent or even opposed to such labors. This attitude of botanists and failure of horticulturists to see the bearings of such experiments on their art, may to some extent explain the temporary oblivion into which Köhlreuter's earlier work passed.

His first success was in crossing Nicotiana paniculata and N. rustica. From the seed produced other plants were raised. Various other experiments followed, sometimes with varieties of one species, more frequently by crossing different species. Though some of the conclusions he derived from his experiments have proved erroneous, partly because he mixed up certain a priori ideas with them, to him is largely due the credit of placing the theory of the sexuality of plants on a firm foundation. Little ground for doubt was left after his careful experimentation, conducted on the strictest scientific lines, and the sex of plants became a fact without dispute, though it had been broached as far back as the time of Aristotle. Köhlreuter claimed that this Nicotiana cross was the first one artificially produced to which absolute credit could be given. There was a bare possibility of their spontaneous production among plants in a wild state, but the antecedent probabilities were against it.

Prepossessions, based partly on such ideas, partly on the great infertility of hybrids and their tendency to revert to one of the parent species, especially when left under conditions to be fertilized by their pollen, hardly left Köhlreuter in a state of mind to do full justice to Linnæus, who was also investigating this subject. The great Swedish naturalist had a lively imagination and drew too much upon it, but every case of the crossing of plants he and his pupils discovered or artificially made cannot be disproved as easily as Köhlreuter and others have thought they might be, so he sets aside the claim of Linnæus to the production of a hybrid Goat's-beard in 1759, calling it but a half hybrid at the most.

In 1757 Linnæus found a Tragopogon in his garden, which he named T. hybridus. It sprang up in a bed where he had planted T. pratensis and T. parvifolius. Winter came on before the seed matured, and he was not able to test its power of reproduction. The next year he fertilized the plants artificially. He removed the pollen of T. pratensis by rubbing it off early in the morning, and a little later in the day brought pollen from T. parvifolius to

* *Botanische Mittheilungen*, vol. ii., p. 188 (note), in an essay on "Die Bastardbildung im Pflanzenreiche."

† Dr. Joseph Gottlelb Köhlreuter's *Vorläufige Nachricht von einigen das Geschlecht der Pflanzen betreffenden Versuchen und Beobachtungen.* (Reissued by Engelmann.) Leipzig, 1893.

‡ All the references in Herbert's book on the Amaryllidaceæ and its supplement (London, 1837) are to the acts of the St. Petersburg Academy, unless a doubtful allusion to "one concerning Nicotiana" is to those begun in 1761.

its stigmas. The heads were marked by a thread. Seeds were formed, which being sown germinated in the autumn and in the following year bore flowers, which were purple, with a yellow base. These also bore seed that matured. An account of the plant was given by Linnæus in a prize essay on the six plants sent to the Academy of Sciences of St. Petersburg in 1760.* It is mentioned in a later paper read at Upsala in 1762 by one of his pupils as being annually propagated by seed.† Focke, who has given us a convenient summary of what is known of hybrid plants, both spontaneous and artificially produced, calls this plant of Linnæus "the first hybrid intentionally produced for scientific purposes," and adds that the objections which have been brought against its hybrid character by Köhlreuter and others "are not sound, since they deal with plants of the second generation."‡ The seeds of the hybrid seem to have reverted to T. pratensis, which was one of the grounds of Köhlreuter's objections, and of his disbelief in the spontaneous production of crosses when the plants were left free to be pollenized by their parents. A spontaneous cross between these species has, however, been reported from the Danish islands of Laaland and Fünen, "the outer flowers brown-violet, the inner yellow."

A limitation is made in the above cases to crosses produced artificially for scientific purposes, for it can scarcely be disputed that Thomas Fairchild, the nurseryman and florist, of Hoxam, near London, had before 1719 artificially crossed Dianthus caryophyllus and D. barbatus. This has since been cultivated under the names of Fairchild's Sweet William, The Mule and D. hybridus hort. The authority given for this is Richard Bradley, an English writer on horticulture and husbandry of the first half of the last century. Hence the credit for the earliest authenticated cross intentionally made is due to a man engaged in the practical work of gardening.

Chicago, Ill. *E. J. Hill.*

The Box-Elder on the Plains.

I HAVE been interested in studying the problem of the distribution of native trees upon the Great Plains and their adaptation to the peculiar conditions which prevail over this great central region of the continent, and no tree has attracted my attention in this region more than the common Box-Elder, or Ash-leaved Maple, Acer Negundo. As it grows upon the Plains it is a stocky tree with a trunk ten or twelve inches in diameter and not more than six or eight feet in length, bearing a rounded bushy top, giving to the tree, as a whole, much of the appearance of a well-grown Apple-tree in an eastern orchard. It occurs along the streams in Nebraska from the Missouri River to the Rocky Mountains, and here and there in favored localities it has pushed away from the streams a mile or so. It appears to be perfectly hardy, and I am sure that I have never seen the slightest indication of injury from the greatest exposure to severe cold.

The Box-Elder has been used very freely by the settlers who took up "tree claims," and for many years, until the repeal of the timber-claim law, there were millions of these trees planted every year in the state of Nebraska alone. The young trees transplant easily and are readily handled, the per cent. of loss usually being very low. Then, again, it is a very simple matter to grow the trees from the seeds, which insures the low price of the young trees. A few years ago I visited a large establishment in southern Nebraska where from eight to ten millions of young Box-Elder trees were grown each year. The winged fruits were collected in the autumn and carefully protected in a great barn, and in the spring these were sown in drills, just as a farmer sows any of his crops. In a short time the little plants pushed through the soil and began to shoot upward. The fields of Box-Elder seedlings were cultivated from time to time, and when a few inches high properly thinned to prevent overcrowding. The crop of trees required little more care than a crop of Corn, and not as much as a crop of Onions or Sugar Beets. Late in the autumn they were taken up by the aid of a special plow, gathered into bundles and stored away in damp, cool cellars, ready to be sent out in early spring. Few trees are as easily propagated and handled. In fact, one could very easily cover hundreds of acres with this tree by simply planting the seeds and caring for the young trees a few years.

The wood is light and easily cut and split, and makes good fuel. The tree might very profitably be grown for supplying fuel, its rapid growth giving it a special fitness for this purpose. Something, too, might be said for it as an ornamental tree. Its rather regular top and light green foliage, which is usually free from insects, make it desirable for the grounds near the house.

University of Nebraska. *Charles E. Bessey.*

What is the Forest Policy of European Nations?

WHENEVER we are about to advocate or inaugurate a new national policy it is wise to see what other nations are doing or have done in the same direction, even though we may not see proper to imitate them.

In regard to its public lands, the policy in the United States has been for the Government to get rid of them as quickly as possible, until in 1891 a new policy was feebly inaugurated with reference to forest-lands by giving the President power to set aside and reserve such areas as he saw fit. This policy has, however, not as yet been safely established, and arguments for upholding it and for securing further application are still in order.

In Europe the tendency at the end of last and beginning of this century had also been to divest the Government of this kind of property under the misapplication of the theories of Adam Smith and the doctrine of individual rights, urged to its most extreme consequences. France, during and after the Revolution, took the lead in this dismemberment of its forest property, selling during the years from 1791 to 1795 nearly one-half of its state forests and continuing to reduce the area until there remained in 1874 but one-fifth of the original holdings of the state. Many of the German principalities followed the same policy, selling off the forest-lands which had been preserved in the Government for centuries.

But during the last fifty years or so of this century a reaction set in; the fearful consequences of unrestricted exercise of individual ownership over this class of property had made it plain enough that the necessity of a change arising from communal interests had come, and now it can be stated that the policy is entirely reversed, that all European nations have the tendency, not only to hold their forest property in Government hands, but to extend it in area and in efficiency, and also to exercise stricter control over the use of private forest property wherever damage to communal interests might result thereby.

Instead of selling, most Governments now buy. There is, to be sure, also selling of Government forest property, but only for the purpose of making the Government forest property more efficient, of consolidating it and of making it serve to the best advantage the purposes of protection to agricultural interests. Thus, in Prussia, agricultural land under forest is exchanged or sold for non-agricultural land or devastated forest property, and servitudes resting on the state forest property from olden times are sometimes removed by cession of forest-lands, so that the bare statistics of the increase in the area of state forests do not tell the whole story.

In France, since 1870, no sales have been made, and by gradual acquisitions a small and steady increase of forest-land has taken place. The difference between the areas in 1872 and 1892 was over 300,000 acres, the state holdings representing now about ten per cent. of the total forest area, and in addition the state has spent in the neighborhood of

* *Amenitates Academicæ*, Gillibert ed., 1787–88, vol. I., p. 212.
† *Ibid.*, p. 182.
‡ *Pflanzen Michlinge*, pp. 221, 430.

$40,000,000 toward reforesting dunes and devastated mountain-sides, and in the budget for last year for its Forestry Department nearly $1,000,000 of the $2,500,000 appropriated for the department is set aside for such extension of forest area and improvement of the existing one. In addition, the private property is controlled entirely as regards clearing; that is to say, no clearing may be done without the sanction of the Government authorities.

In Prussia, which represents about two-thirds of Germany, the policy of selling also prevailed in the beginning of the century, but since 1831 a constant increase has taken place, the increase in the old provinces from 1831 to 1892 being but a small fraction, but in the entire monarchy from 1870 to 1892 it amounted to 280,000 acres. Here, especially, the apparent small increase is due to the fact that much land was exchanged or given to get rid of servitudes, obligations which were a charge on the forest property. For this purpose 125,000 acres were ceded, besides the payment of fully $20,000,000 in money, all of which represents an increase in the efficiency of the remaining forest property. Altogether, between the years 1867 and 1895, over 22,000,000 marks were spent in increasing the forest area, and the budget for 1895–96 contains an item of 2,000,000 marks for the purpose of acquisition. In addition it is of interest to note that during the last twenty-five years the conservative management has resulted in increasing the stock of wood in the state forests by over 25 per cent., in spite of the fact that the annual cut has increased by 40 per cent., while the receipts have increased by 50 per cent., although the expenditures, and especially the salaries of the forest officials, have been increased during the same time. The net income was of the gross receipts—in 1830, 61 per cent.; in 1870, 52 per cent., and in 1893, 47 per cent. The control of private forest property in Prussia is, perhaps, least developed in the German states, the necessity for such control being probably less on account of the situation of the larger part in the plains country, and also because the large holdings of the great proprietors were less liable to dismemberment or mismanagement. The belongings of the communities, however, are under the same control as in France, and legislation looking toward greater control of private property wherever communal interests are involved is in preparation.

In other German states we may note an increase of 4 per cent. in the state forest area for Bavaria between the years 1873 and 1890—an increase of over 3 per cent., by purchase, for the state forests of Württemberg, the one state in Germany where clearing is also absolutely controlled by the state authority. A small increase is notable in Baden and Saxony, so that we see Germany, as a whole, is increasing its state forest property.

In Austria the selling craze lasted until about 1872, and now the state is the only great purchaser, buying, besides minor lots, in 1886, 60,000 acres; in 1888, over 230,000 acres, and in 1891, 210,000 acres in single purchases.

Italy, to be sure, has been too poor to enlarge its state property, but the laws of 1877 and 1890, which provide for reforestation of denuded mountain lands with financial assistance to the communities from the Government exchequer, exhibit the conservative tendency of the Government and its recognition of the fact that a strong communal interest attaches to this kind of property.

Even Russia, though probably the least-developed of the European countries, and largely in the pioneering stage, holds on to its Government possessions, provides for their rational administration and extends the same where this is desirable. In the extreme north, where more than one-half of the country is still covered with woody growth, no forest policy, probably, is carried out. In the central states and Baltic provinces, representing one-quarter of the total area, where the percentage of forest land sinks below 30 down to 17 per cent., a conservative forest management of the Government forests after the pattern of Prussia is established; and in the prairie country on the southern third of the empire large amounts of money are spent by the Government in planting forests or assisting private owners to do the same. Russia, therefore, does not sell any of its real timber-lands, excepting where communities do not own their timber, and, therefore, the state property is liable to depredations, when the Government tries to obviate the difficulty by makIng the community owner. In addition a very elaborate law exists for the purpose of preventing mismanagement, which places the approval of working plans, of making clearings, etc., in the hands of a specially constituted committee for each department, and the Government itself must secure the approval of this democratic committee for its operations.

Finally, while England has not any forest area worth speaking of, for India, at least, the same policy of conservation and of increasing Government control is notable. Her Indian forest policy was inaugurated about 1873. From 1882 to 1892 the reserve forests were increased from 46,213 to 59,743 square miles, and the total forest area under the control of the Government from 71,972 to 114,966 square miles. Strong efforts are being made to place the entire forest under the direct control of the Government.

We see, then, that these nations, having learned from sad experience, reversed in time their policy and act upon their knowledge that forest property is best preserved in the strong hands of Government, which is permanent, as the forest cover in the mountain must be to secure favorable agricultural conditions. Must the United States learn also from her own experience, or can the lesson be learned from the experience of others?

Forestry Division, Washington, D. C. *B. E. Fernow.*

Plant Notes.

Stuartia Pseudo-Camellia.

THE genus Stuartia, a member of the Tea or Camellia family, named in honor of John Stuart, Marquis of Bute, is distinguished by its deciduous membranaceous oblong-ovate serrulate leaves, large solitary axillary flowers with five or six sepals and five or six obovate crenulate white petals, and by its five-celled pods with one or two seeds in each cell. The genus is confined to eastern Asia, and to eastern America, where there are two shrubby species; one of these, Stuartia Virginica, grows only in the coast region of the southern states and bears the largest and most beautiful flowers of any member of the genus which is now known; the other, Stuartia pentagyna, is common on the lower slopes of the southern Appalachian Mountains, where it sometimes grows in great profusion, especially in eastern Tennessee. In Japan and China there are two or three species of Stuartia. Only one of these, however, Stuartia Pseudo-Camellia, is a common plant in Japan; the others are either confined to the southern islands or are extremely rare, and neither of them is found in our gardens. Little is known of Stuartia in China beyond the fact that one of the species of southern Japan extends to the mainland, where it is not improbable that other members of the genus will be found.

Stuartia Pseudo-Camellia (see illustration on page 35) is a tree upward of fifty feet in height, with a trunk sometimes two feet in diameter, and in the mountain forests of central Japan, where it is abundant, is always a conspicuous object, owing to the smooth, bright red bark, which peels off in great thin flakes like that of the Crape Myrtle (Lagerstrœmia), and gives the tree its name of Saru-suberi, or Monkey Slider. The handsome dark green leaves, which insects do not mutilate yet in our gardens, and the large delicate flowers, whose beauty is heightened by the contrast between the purple stamens and the white petals, need no special description, for, in general appearance, they resemble those of our native species.

Thirty years ago Stuartia Pseudo-Camellia was sent to the United States by the late Thomas Hogg. It was propagated with other Japanese plants in the Parsons' Nursery, at Flushing, Long Island, and flowered several times in the neighborhood of this city some years before its flowers

unfolded in Europe, where it is now rightly considered one of the most attractive garden shrubs.

In Japan Stuartia Pseudo-Camellia grows freely up to elevations of three thousand feet above the level of the sea, and in the United States is perfectly hardy as far north as eastern Massachusetts, the specimen from which our illustration is made having been produced in the Arnold Arboretum. Stuartias can be raised from seed and by layers, which, however, take some time to produce roots. They require deep rich soil, delighting in a compost of peat and loam; they grow slowly and do not begin to flower early, but once established they go on improving for many years, and are among the most beautiful and desirable of shrubs.

Fig. 4.—Stuartia Pseudo-Camellia.—See page 34.

PYRUS CORONARIA.—Few small trees are more desirable than the Crab-apples from Japan and Siberia, which we have often commended in these columns. But our native Fragrant Crab, as it is sometimes called, ought not to be neglected, especially when parks or large grounds are to be planted. The beauty of this tree was appreciated by the early settlers in this country, and the Swedish traveler, Kalm, notes that in Pennsylvania and New Jersey single

trees of this species were even then often planted near farm-houses on account of "the fine smells which their flowers afford." It has been a favorite garden tree in Europe for more than a century, and our European correspondents have commended it as having few rivals among ornamental Pears and Apples, although of late years it seems to have been somewhat neglected. When at its best in the lower Ohio valley and in the states west of the Mississippi River it is a bushy tree sometimes thirty feet high, with a trunk more than a foot through, breaking into stout spreading branches eight or ten feet above the ground. Usually it grows smaller, and sometimes is little more than a shrub with stiff contorted branches. Its small size and attractive habit give it a value for wood borders, shrubberies and even for small gardens. Its pale pink or rose-colored flowers appear ten or twelve days after the petals have fallen from other Apples. They are nearly two inches across when fully expanded and have a delightful odor. The waxy, translucent fruits, which are from an inch to an inch and a half in diameter, hang gracefully on long stems and remain on the branches until after the leaves have dropped in autumn, when their greenish orange color, flushed with scarlet as they ripen, and their delicious fragrance make the tree quite as ornamental as it is in June.

Begonia Evansiana.—This plant, often called Begonia discolor, is a native of China and Japan. It is much the hardiest of all the Begonias so far as known, and we have often commended it for this quality as well as for its beauty. The plants, of course, die down root and branch every year with the first frost, but the bulblets, which form plentifully at the bases of the leaf and flower-stems, will have fallen to the ground; these sprout just as soon as warm weather commences the next year, and soon develop into blooming plants. Mr. Oliver writes that this Begonia has become naturalized in the Botanic Garden at Washington, not in one place only, but in several, for over thirty years. It seems to like positions for hibernating which are not affected in the least by sunshine. On the north side of a house, close to the wall, it comes up abundantly every year—in fact, far too abundantly, for many of the plants have to be pulled up to give the remainder a chance to develop. The bulblets do not receive any protection whatever in the way of mulching; they are invariably left to take care of themselves. The rock-garden is another spot where this Begonia is at home; those bulblets which fall on the shady side of the rocks survive the winter with ease, while those which are exposed to the sun, owing, perhaps, to successive freezings and thawings, are killed. After the plants are up a certain height a little decayed manure thrown over the roots accelerates the growth of the plants and produces a heavy crop of flowers. Some interesting experiments have been made at the Washington Gardens with this plant, where new colonies have been started with bulblets from plants growing out-of-doors, and also from those which have been grown for years in a hothouse. While it is an easy matter to start a new colony in a suitable place with plants or bulblets grown outside, it is difficult to get a plant from indoors to perpetuate itself in the open air. The plants from the hothouse form bulblets enough, but in winter they require protecting by dry leaves or some similar covering for a season or two.

Cultural Department.

Winter Work among Insects Injurious to Fruits.

MR. M. V. SLINGERLAND, of Cornell University, makes some timely observations on this subject in the current number of *The American Agriculturist*, the principal points of which are here reproduced:

The burning of fallen leaves and other rubbish in or near fruit plantations of any kind will prevent many insect pests from obtaining winter shelter near their food-plants, and those pests already in hibernation will be killed. Many of our worst insect pests, as the plum curculio, thus hibernate in rubbish. It is a good practice to scrape off the rough bark from the trunks and larger branches of fruit-trees, for many caterpillars of the codling moth (then in their little cocoons of silk), the hibernating adults of the pear psylla, and the hibernating eggs under the scales of the oyster-shell bark-louse and the scurfy bark-louse will be dislodged or killed. A coating of white-wash or some similar wash will tend to keep the bark clean, thus rendering it less attractive as a hibernating place for insects.

If fruit-trees are pruned at any time during their dormant period, the prunings should always be burned. These prunings will often bear the wintering eggs of the different kinds of plant-lice (as the apple and cherry aphides and the hop aphis, whose eggs are laid on Plum-trees) that appear in such great numbers on the trees in the spring and summer. The half-grown caterpillars of the cigar-case-bearer are also then snugly tucked away in their little curved cases attached to the bark of the twigs, and many would thus perish on the prunings. This insect has recently come to be a serious Apple pest in western New York.

Trees infested with the oyster-shell bark-louse, the scurfy bark-louse, the San José scale or any other scale insect should be thoroughly washed with whale-oil soap in a solution of one or two pounds to a gallon of water. It should be remembered that the wash must come in contact with the insects to kill them. With this wash, or with a strong kerosene emulsion, many of the adults of that dreaded pest, the pear psylla, then in hibernation in sheltered places on the bark, can be killed.

The New York Plum-scale, which has recently caused great destruction in western New York Plum orchards, can be fought to the best advantage only when the trees are dormant, as the scales are then young and tender and lie exposed on the bark. Badly infested trees should receive a thorough spraying with kerosene emulsion (Hubbard-Riley formula diluted four times) in the fall, in the winter if possible, and another very thorough application early in the spring before the buds swell.

The eggs of several insect pests can be collected and destroyed during the winter, thus greatly reducing the numbers of the pest the next season. The eggs of the Apple-tree tent caterpillar are glued together in a large, conspicuous mass, which usually encircles a twig; it is a short job to look over a tree and remove these egg masses. The eggs of the white-marked tussock-moth form a very conspicuous large, white, froth-like mass on the bark of the trees, or on near-by fences or buildings; this is the insect that is ravaging the shade-trees in several of our large cities. It was nearly exterminated in Rochester by offering prizes to the school children for collecting the eggs; the children collected millions of the frothy egg masses. The eggs of the four-lined leaf-bug, a serious Currant pest in some localities, are laid in slits cut in the shoots near the tips; the white ends of the eggs project out of the slit, and one can thus quite readily determine the infested tips and cut them off. The long ragged scars or slits often found in Raspberry-canes, or in the twigs of fruit-trees, are the work of the snowy tree-cricket, done in laying its eggs; this is the only damage done by the insect. The infested canes or branches are readily seen, and should be removed. When the eggs of any of these insects have been collected, they should always be burned. If left on the ground they will hatch as readily there as on the tree or bush, and the young will easily find their way to their food.

Currant-bushes and Raspberry-canes are often infested with borers; two kinds, a beetle and a moth, work in currants. Usually the infested shoots can be quickly detected in the spring when growth begins, and all such should be removed and burned at once, thus destroying the developing insect life they contain. The hydrocyanic acid gas treatment, so extensively used in California, will probably never come into general use among New York fruit growers. It is too expensive, and most of our insect pests can be effectively combated by other means with less labor and expense. There is scarcely any question about its efficiency against all insect life, especially scale insects; we have been unable to find a living San José scale on trees treated with the gas. It is the most efficient and practicable method for our nurserymen to use in fumigating their stock to prevent the distribution of the San José scale, the pear psylla, the bud-moth and other serious pests. There is no longer any doubt that some New York nurserymen are sending out these insects on their stock; and the time may soon come when they will be compelled to resort to fumigation with the gas to protect their trade, and the matter is worthy the careful attention of nurserymen throughout the country.

Cultivation of the Tomato.

THE Tomato is an annual, a native of tropical America, and under normal conditions completes its cycle of life in from one hundred and fifty to two hundred days. For the first ninety to one hundred and twenty days the plant gains at a constantly increasing rate in size and vigor, acquiring a sort of momentum of growth, and then commences to mature its fruit, expending more and more of its strength in this way until the plant becomes exhausted and dies. The preliminary accumulation of vital energy is essential to perfect fruitfulness, and if it is not established or is lost through a check in growth the plant will endeavor to develop it by extending the growing period into that in which under normal conditions its undivided energy would be expended in the production of fruit. A temperature of about seventy degrees in full sunlight is essential to the best development of the plant during the growing period, and one ten degrees higher is most favorable for the maturing of the fruit, and the plant will not thrive if either the air or soil is much colder. As in its native home favorable conditions of heat and moisture are during the growing season very constant, we are not surprised to find that the plant has little ability to endure unfavorable conditions. In a temperature of forty-five degrees or less, either of the soil or air, the plant not only will not grow, but will lose vigor and vital energy, the injury being proportioned to the duration rather than the degree of cold, although a freezing temperature for an hour will kill it.

In the latitude of Detroit the average temperature at noon is not as high as seventy degrees until about June 1st, and it is only during August and September that the average noon temperature reaches eighty degrees. It is thus evident that in order to secure a perfect development of the Tomato in this latitude we must extend the season artificially, and the only practical way to do this is to start the young plants under glass. If we sow the seed about April 10th, supply the necessary conditions of light, air and heat to secure a natural, healthy and vigorous growth, the seedlings will be as large as it is practicable to transplant by June 1st, which is as early as favorable conditions of soil and air can be expected, and if we then set out the plants without seriously checking their growth they will reach their full size and acquire the vital energy necessary to the production of a maximum crop of fruit by July 20th or August 1st—as soon, that is, as favorable weather for the ripening of the fruit can be expected. The common practice is to plant the seed much earlier, often as early as March 1st; this gives ninety days before the conditions are such as to make it safe to set the plants in the open ground, and if the plants grow naturally they would reach their full size and be far too large for transplanting without most serious check. On the other hand, to grow the plants so slowly that at the end of ninety days they are still of a size suitable for transplanting, is to fail to develop any of that momentum of growth which is essential to perfect fruitfulness. Such plants can never in our climate give a maximum crop of fruit, though they may reach full size.

It seems, then, that a careful consideration of the character of the plant and the climatic conditions we have to meet will lead to the adoption of the following as the best method of adjusting them: Sow the seed between April 1st and 10th in boxes of light, loose soil, kept at a temperature of about sixty degrees and moderately moist. As soon as the plants have started true leaves, transplant into small pots or other boxes; if in boxes, they should contain three to five inches in depth of light rich soil, and the plants should be set four inches apart each way. If pots are used, the plants should be repotted into larger ones often enough to prevent their becoming pot-bound. A day temperature of sixty to seventy-five degrees should be maintained, with the soil and air moderately but constantly moist. Above all, an abundance of light and air must be provided, a necessity which makes a special hotbed, or a well-protected cold-frame where the soil has been well warmed up, a better place to grow plants than a greenhouse. In the mean time the ground where the plants are to be set should be thoroughly prepared by first a deep cultivation, then an evenly spread dressing of well-rotted manure, which should be well worked in. Plowing or spading and cultivating should follow, and after an interval of a few days another cultivation as deep as possible, and the land should again be cultivated just before setting the plants. The purpose of this is to form a deep bed of well-warmed and friable soil in which the finely divided fertilizer shall be well mixed, and which will retain as much as possible of the spring rains. This thorough preparation of the soil is the prime secret of successful Tomato culture, and it is much cheaper and better to do the necessary deep cultivation before the plants are set. In this latitude the danger of cold storms is rarely over, and the soil is rarely warm enough to warrant the setting of plants before June 1st, and where the ground is well prepared and the plants well grown there is no advantage in putting them out till the conditions are favorable for rapid growth.

Give the plants but little water, barely enough to prevent wilting, for four or five days before, and a liberal watering two or three hours before setting. In putting out the plants be careful to save as many of the roots as possible and to get them into the ground in a natural position without being kinked or crowded together, and, if it is practicable to do so, soak the ground about the plant after setting, but if this is done care should be taken to draw some dry earth over the wet soil, so as to prevent its baking and cracking. A few days after the plants are set stir the surface soil with a hoe or rake, and repeat this every few days as long as the size of the plants will permit. If the preparation of the ground has been thorough there will be no need of deeper cultivation, which would do more harm than good. If a smaller quantity of extra-fine fruit is preferred to a larger yield of that which is simply good, it will be better to stake or trellis the plants. For this purpose we have found nothing better than four two-inch square stakes, about six feet long, driven into the ground in a square of about sixteen inches around the plants. From four to six branches are allowed to grow up within the space enclosed (the others being removed as they appear), and are held therein by strings around the stakes, kept in place by occasional tacks. We think, however, that, except in very heavy and wet soils, more satisfactory results will be secured from unpruned plants which are allowed to rest on the ground.

Detroit, Mich. *Will W. Tracy.*

Winter-flowering Begonias.

BEGONIA, Dr. Nacthingale, is a garden hybrid, evidently closely related to B. nitida. Like that plant, it is deliciously fragrant. Its habit is better than the type, being less angular. The panicles and also the individual flowers are larger and of a clear bright rose-color. It is very floriferous, never at any time being out of bloom.

After two years I have succeeded in growing well-flowered plants of the distinct and beautiful hybrid known as Gloire de Sceaux. A figure of it appears on page 185, vol. vii., of GARDEN AND FOREST, which, as stated in the accompanying description, does not do it justice. It is a neatly growing bushy plant, about a foot and a half high, well furnished with nearly orbicular, deep bronzy green leaves. The flowers appear near the ends of the branches in short scape-like panicles, and, unlike most of the shrubby kinds, the male flowers are the largest, showiest and most persistent. The flowers are clear pink, sepals and petals rounded, and nearly equal in size. This is the only characteristic of the pollen parent, Begonia Socotrana, visible. In foliage and general habit it resembles its seed parent, B. subpeltata. We grow it in good rich loam with plenty of drainage and in a shady position in a greenhouse at an intermediate temperature.

Begonia Haageana is a very interesting and beautiful species, evidently related to B. Scharffiana. It makes a handsome specimen plant, whether in bloom or not. The leaves are light bronzy green, irregularly ovate, tapering and covered on both sides with a rather bristly pubescence of reddish brown hairs. It flowers sparingly all the year round in large rambling panicled cymes of light pink flowers. Both the sepals and petals in both the male and female flowers are covered on the outer surface with brownish hairs, a character not common among Begonias. Outside this type the only other kind I remember with this peculiarity is the well-known B. metallica.

Begonia Credneri is another of these hairy kinds. The whole plant is stouter, with a more deeply bronzed tint. The leaves are rounder and more bluntly pointed. The inflorescence is quite erect; the flowers nearly white, and almost covered on the outside of the sepals and petals, and the ovary with bright red hairs. It is quite as handsome a plant as B. Haageana, but not so free in growth.

Paul Bruant, a short-jointed, erect-growing, bushy kind, with irregularly cordate, deeply cut and wavy deep green leaves, is one of the best I know of, for window decoration. The flowers occur in large drooping panicles, reddish pink in color. Only the female flowers are persistent, and with large red-winged ovaries make a very pretty effect. I have known a plant to remain well in bloom for six weeks in an ordinary house window.

When Mr. Veitch, of London, was here a year ago, he was surprised to see large, well-flowered specimens of one of their recent hybrids, President Carnot. It is a robust-growing hybrid, and had been a small plant the spring previously.

Planted out for the summer, with unrestricted root-room, it had made strong canes four feet long and very stout, without blooming, having been used for tropical effect, for which it is extremely well adapted. It lifted well, ripened the stout wood it had made and bloomed profusely all winter long. This year I thought to make neater specimens by growing them in pots, but results prove the plants have not the stamina for a good show of bloom. The panicled cymes are very large, drooping from near the ends of the branches, and if the branches be long, as when the plants are grown out-of-doors, they have a somewhat leggy appearance. These branches root easily any time during the summer, develop the panicles which show in the bud state when the cuttings are taken, and make neat little specimens which can be planted out the succeeding summer. The individual flowers are very large. The whole flower, including the large winged ovaries, are bright coral-red, from which we may probably trace its parentage, on one side, to the old B. (rubra) corallina.

Ferdinand de Lesseps is another of these large hybrids into which the blood of the bronzy leaved Begonia olbia has been some way infused. This is evident in the short, almost hidden cymes, and in the reddish bronze under-surface and margined leaves. This, also, is better for a season out-of-doors, needing age and well-ripened growth to bloom well.

Wellesley, Mass. *T. D. Hatfield.*

Siegesbeckia orientalis.—Last June we received from the Royal Botanic Gardens, Buitenzorg, Java, a large number of packages of seeds, principally natives of that island. I sowed the greater portion as soon as they arrived, and have been much interested in watching their developments. The above-named plant was in the collection, and though by no means ornamental, it is interesting botanically. My first impression of the plant when it began to flower was a miserable weed. It is an annual, and belongs to Compositæ. The leaves are cordate, with coarsely serrated margins, four inches long by two inches wide. The flowers are small and yellow, and rather inconspicuous, but the flower-heads have, in addition to the scales with which Composites are surrounded, five spreading, rather long, involucral scales, which are covered with glandular hairs, each having a drop of viscid fluid at the tip. These hairs catch insects, apparently with the same ease as Droseras, as there are numbers of small insects caught on the plants we have here. Whether these insects are of any use to the plant after being caught is a problem for botanical students to solve. I do not know of any insectivorous Composite, and possibly the viscid glandular hairs are for a protection for the flowers from small insects, yet from their spreading position and the smallness of their number this is hardly probable. Many plants have sticky hairs on the stems and flower-stalks, to prevent ants and other insects climbing and stealing the nectar; as, for instance, Browallias, Cupheas, Primulas, Plumbagos, etc., but I do not remember ever seeing them hold insects, as this plant does. S. orientalis is by no means a rare plant, as it is largely distributed through the tropics, under the name of S. droseroides, apparently from the resemblance of its involucral scales to the leaves of Drosera. It is well worthy of a place in botanical collections, and I find it does best in the warm temperate house.

Northampton, Mass. *Edward J. Canning.*

Cytisus racemosus.—This is a common greenhouse shrub, and one of few plants with yellow flowers which are available to any extent for winter and spring decorations. It can be had in bloom from January onwards. By regularly pruning into bushy shape, plants may be grown for many years and make large specimens. This is practiced only in private places; for commercial use new stock is annually raised. Cuttings are taken from half-ripened wood and put in pots filled with sandy peat, or in a cool propagating-bed to callous. Afterward, a bottom-heat of sixty-five degrees, Fahrenheit, will induce new roots, and the cuttings should be ready for potting off in two or three weeks. They should be grown continuously in small pots for the first season, as it is almost impossible to lift plants which have not previously formed a ball of earth. Small plants rooted last spring and grown to a single stem in four and five inch pots are perfect pyramids from one to two and a half feet high, showing bloom for nearly the entire length of the stem.

Wellesley, Mass. *T. D. H.*

Cœlogyne cristata.—Next to Cattleya Trianæ, this is the most useful Orchid of the midwinter season. The abundance of its snowy flowers, its dwarf habit and dark glossy foliage make it truly beautiful at this season. The flowers, which measure about four inches across, are produced in loose racemes resting on the foliage. Except for the rich golden-yellow fringes inside the lip, the color is pure white. The bracteate peduncle springs from the base of an oblong, shining, bright green pseudo-bulb of a walnut's size. The pseudo-bulbs are formed on creeping stems, and bear one or two long strap-shaped leaves of a dark green color. A cool well-ventilated house in a northern position is best in summer, and during the flowering season the plants should be kept in the coolest part of the greenhouse. While growing they need frequent syringing and watering and occasional fertilizing with weak liquid-manure.

Newark, N. J. *N. J. R.*

Correspondence.

The Pepper-tree for House Culture.

To the Editor of Garden and Forest:

Sir,—Your recent article on the Pepper-tree leads me to add that it is readily grown from seed and makes a pleasing window plant. I have a plant now over five feet high, with the characteristic drooping branches. Daily showering seems to induce floriferousness. It has thus far never borne fruit. It is peculiarly free from all insects save the scale, which seems to have a special liking for it. I have tried in vain to discover why the apparently spontaneous movement of the leaves in water is at times so much more marked than at others, and suspect your statement that "in wet weather the leaves emit a pungent odor," has given me the clew.

Klinger Lake, Mich. *B. L. Putnam.*

Meetings of Societies.

Horticulture in Pennsylvania.

THE thirty-seventh annual meeting of the Pennsylvania Horticultural Society was held in West Chester last week. In the interesting report of the Fruit Committee it was said that in the south-eastern counties of the state the fruit crop was unusually abundant, being in many sections the heaviest known, while in the greater part of the state there was a slender crop, owing to late spring frosts and a dry summer. In the north-eastern part of the state the Pear blight was more destructive than it has been for twenty years. Peaches only yielded from one-tenth to a quarter of a crop; Cherries in the south-east gave a small crop, Early Richmond, Montmorenci and Napoleon Biggareau being the best varieties. Of blackberries there were practically none, and but few raspberries and strawberries. It was reported also that the San José scale, which seems to have established itself securely in the east, had already been found in half a dozen different parts of the state.

The subirrigation of Strawberries was discussed in a paper by Mr. Martin Brinser, of Middletown, who stated that there were two ways of practicing this. One was by supplying water through tiles laid underground, and the other by subsoiling, so as to hold the rain-water. This last method is quite satisfactory where there is a compact soil beneath. Deeper plowing makes a deeper reservoir, which holds more of the winter and early rains. After plowing deeply the land can be subsoiled so as to loosen the soil to a point sixteen inches below the surface. In this way Mr. Brinser had produced excellent crops of cherries during the last dry year. In addition to the subsoiling, Mr. Brinser used frequent shallow culture, which furnished a dust mulch, so that during the dry weather moisture could always be found an inch below the surface. Mr. Ingraham, of West Chester, said that he had tried subsoiling several rows of Strawberries at the foot of a hill, and the beneficial results were plain. Mr. H. M. Engle argued that while some lands were aided by this practice, he had found that in loamy open subsoils not much benefit was derived. Mr. H. D. Van Deman, formerly Pomologist for the United States Government, thought that subsoiling was one of the very best practicable methods of storing up water for crops. A layer of finely pulverized soil resembles a sponge, and if it were three inches thick it would hold half as much as one six inches deep, and one one-third as much as one nine inches deep. Subsoiling has the practical effect of under-draining—that is, it makes a wet soil drier and makes a dry soil wetter. The deeper a hard soil is loosened up the more moisture it will hold, and plants require all they can get in this latitude. The object is to hold the winter rains in a reservoir rather than to allow them to run off. Professor Heiges told of some scions he had received from Oregon with their buds all started. He grafted them and then planted them in ground from which the surface soil was

thrown off, and the trench was then deeply spaded. After planting his trees he had the surface soil thrown back, and, in spite of the dry weather, ninety-five per cent. lived, and he believes that he would not have saved one-quarter of them if he had planted without such careful preparation.

Mr. Calvin Cooper, in speaking of fertilizers, urged farmers to secure their own nitrogen with the help of leguminous plants, in doing which they will be able to get some potash besides. Another member claimed that on the cyanite grass-lands about West Chester commercial fertilizers gave no appreciable returns, while on the lighter soils farther south he had a farm on which he used four hundred pounds of complete fertilizers to the acre, and nothing else. He had continued this practice for ten years, sold everything off his land and yet his crops were increasing. Mr. Van Deman thought we did not sufficiently consider the fertilizing value of tillage, since this practice liberated the plant-food in the soil. He thought that millions of dollars were wasted every year in the purchase of commercial fertilizers. It was best for farmers to buy a high grade of muriate of potash, as it contains the least foreign matter, and either bone or dissolved South Carolina rock for phosphoric acid and then try to get nitrogen by trapping it from the air and soil water with leguminous plants. When we can catch nitrogen so readily we ought not to buy such an expensive material for orchard purposes. Some soils have enough potash, but it does not leach out if more is applied. An excess of nitrogenous plant-food makes a leafy, succulent growth, and some Peach growers in Delaware, who have plowed under heavy crops of Crimson Clover, have found that there was enough nitrogen in this green manure to hurt their trees. It is their practice now to cut the Clover and turn under the roots, which contain all the nitrates necessary. Potash and phosphoric acid are the two elements most needed in orchards. In a subsequent paper, Mr. Van Deman said that potash, phosphoric acid and nitrogen were of no use unless they were dissolved, and they could not be dissolved without water. Sap is plant-food dissolved in water; then nature mulches with leaves and the like to hold the water. As fruit growers cannot follow nature's way they should mulch by tillage. Plant deep, make a basin to hold water in and cultivate to keep it there. In speaking of irrigation, he said that a one-inch pipe with six-feet head ought to irrigate an acre. Mr. H. M. Engle, of Marietta, said that an inch pipe with eighty pounds head had supplied a quarter of an acre and they paid eighteen cents for a hundred gallons of water. Some of his crops paid for this expenditure, and others did not.

The pruning of orchards was the subject of an address by Mr. Calvin Cooper, who stated that he had set out an orchard thirty-four years ago, forcing its growth while young, and now his trees are overgrown and declining when they should be in their prime. Fourteen years ago he set out another orchard on comparatively poor ground, used no fertilizers and pruned the trees freely. He starts the tree with three branches and a leader and allows branches above, but leaves an open top. The best sprayer he could find three years ago would not reach the top of these large trees. Two years ago he cut off from ten to fourteen feet from the top of each and thinned them out, and now he gets good fruit. He uses an Excelsior sprayer, making three applications of Bordeaux mixture and Paris green and occasionally some clear copper sulphate before the buds swell, if the scab was bad the year before. Varieties that do not grow upright he prunes so that the last bud is on the lower side of the limb, while those which tend to spread have the last bud on the upper side. When pruning is done in winter the bark is bruised less than at other seasons, and it will not hurt the tree if the wood is slightly frozen, but it is better to prune at some time when the tree is entirely dormant. Mr. Gabriel Heieter, of Lancaster, pushes his trees as hard as he can all the time, then puts in a crop to check growth and throw them into bearing, and afterward feeds again. He thought that Apples must bear a crop every year if they are to be profitable. This means strong feeding and the control of insects and fungi, so that the leaves will be kept on the tree to make apples mature later and thus keep better. The finest fruit grows on young trees or on the young wood of old trees. On a rich soil a young tree will bear two or three crops in succession, and then, as the fruit-buds begin to crowd, it will bear only on alternate years. An annual bearer has its fruit-spurs separate. The top should always be kept young by going about the tree with long pruning-shears and taking out old spurs. A vigorous tree will be less liable to danger from frost than weaker ones.

The last afternoon was devoted to the subject of orchard planting, in which Professor Bailey made the principal address and answered many questions. In his opinion the hope of old orchards is to plant new ones. His advice was to make the land rich and deep to hold moisture, although he thought that subsoiling would be of only temporary value. We never have rain enough in a summer to grow crops, and hence the need of tile draining, subsoiling and the use of deep-rooted plants to break into the subsoil as much as possible. The ground should be plowed in the fall, or some other device should be used for catching the winter rain. Clayey lands after hoed crops often run together and puddle if they are fall-plowed. For fertilizers Clover was advised for nitrogen, and two hundred to four hundred pounds of high-grade sulphate of potash and about the same of bone should be used every two or three years. Four-fifths of the orchards planted never amount to anything from lack of care, and this makes the field a more profitable one for those who give proper attention to selecting varieties and growing them properly. In his own orchard he is taking pains to work his trees over with scions from individual trees that are known to be doing well, and he will spray at least twice, once just before and again just after blossoming time.

The Minnesota Forestry Association.

THE annual meeting of this vigorous organization was held in Minneapolis last week, and, among other important matters discussed, was a proposition submitted by J. M. Cross, Esq., to the purpose that the state shall receive donations of stump-lands from lumbermen on the condition that they and their heirs shall receive one-third of the proceeds for one hundred years, after which they will revert to the state. One-third of the proceeds is to go to the state for the care of the land, and the remaining one-third to whatever institutions the donor may indicate. This proposition received much approval, and was submitted to a committee for action. The value of these stump-lands was a subject of much discussion. Most of them in the state are burned over and the seeds and seedlings destroyed. They should be taken in hand at once after they are cut.

Prairie forestry was another subject which commanded much attention. The failure of the Cottonwood for general planting was noticed, and the Ash and Bur Oak were spoken of most favorably, and after them the Hackberry.

The instruction in forestry at the University was shown to be more considerable than was generally supposed, since, under other names, it covered most of the branches of the subjects which are studied in Europe. Prairie forestry now receives the most attention, and the students have the actual care of a plantation of twenty acres. The care of natural forests has not received much attention, since, as yet, there has been no demand for skilled foresters. Experiments in caring for natural woodlands were strongly recommended, so as to secure data from which a policy could be formed. It was said that estimates could be made from observation in the woods we already have which would furnish facts or principles which could be used in constructing a system for the preservation of forests, and especially for their protection against fire.

Attention was called by D. R. McGinnis, of the St. Paul Commercial Club, to the fact that the water-supply of interior continental regions is diminishing the world over, and that the people of Minnesota had reason to use intelligence in preventing such droughts as threatened the interior of this continent.

A summary of the year's work seemed to show a substantial gain, especially in the improved management of the state lands and the establishment of a system of protection against fire. Other good work is under way, with a promise of favorable results.

Recent Publications.

Down the Lane and Back. By Uncle Matt. T. Nelson & Sons, London and New York.

This little book is a talk with children about a few of the weeds and wild flowers which one would naturally find along a country roadside in England. The illustrations are admirable, and the text is so instructive that we think it is a mistake that some one has not modified it so that it will suit an American wayside as well as an English one. This is the first book of a series, each devoted to a ramble, and their character can be seen from such taking titles as Through the Copse, A Stroll in the Marsh, Across the Common and Around a Corn-field. After all, many of the flowers described have made themselves as much at home

in America as they are in England. Here are Nightshade, Buttercup, Dandelion, Mallow, Bindweed, Marsh Marigold, Meadow-Sweet, Plantain, Harebell and Silver-Weed running wild—either the identical ones figured, or such near relatives that the picture of one will answer for both—while the Corn Bluebottle, Ragged Robin, Wild Hyacinth and many more can be found domesticated in country gardens, so that the little books can be used to a considerable extent as manuals for young botanists even on this continent.

Notes.

It is estimated that in Ventura County, California, alone 15,000 tons of Lima beans and 7,500 of other beans are raised annually.

We learn from *Le Petit Républicain de l'Aube*, published at Troyes, France, that Monsieur Charles Baltet received the Prix Montyor for his book, *L'Horticulture dans les Cinq parties du Monde*, from the Société Académique of that city at its meeting held on the 18th of December last.

The latest results of comparative experiments with bone meal and other phosphatic fertilizers seem to show that the superior value hitherto given to the undissolved bone is due to the nitrogen which it contains and not to the phosphoric acid. As a phosphatic fertilizer bone meal gives no better results than the mineral phosphate.

In an address recently delivered in Munich, Dr. Baur, Rector of the Ludwig-Maximilian University, mentioned that sixty per cent. of the wood now yielded by the state forests of the kingdom of Saxony is used in the manufacture of paper pulp. In other European districts there is likewise a great and growing demand for timber for this purpose. And the extent of the demand in this country may be divined from the fact that pulp mills have been built at seven places in the single county of Penobscot, in Maine, and that the daily product of three of these mills constitutes a train-load of paper pulp, usually consisting of eighteen or twenty car-loads.

Dr. D. T. MacDougal has taken pains to verify the results of former experiments, which show that the leaves and stems of adult plants of Cypripedium spectabile and C. pubescens exert a poisonous influence on the human skin. Later tests with both these plants and C. parviflorum establish the fact beyond doubt that all three of these species are poisonous. The irritant action is found to be due to a secretion of the glandular hairs. On account of the extremely small quantity of this secretion its exact chemical nature has not yet been ascertained, but it was found soluble in alcohol and gave the reaction of an oily substance. The irritant action of the plants increased with their development and reached a maximum effect during the formation of the seed capsules.

A memorial has been addressed to Congress by the legislative assembly of Arizona, asking that the lands covered by the famous "petrified forest" should be reserved as a public park. They form an area about twelve miles square and lie in the heart of the Apache country. But, despite the remoteness of the spot, curious tourists have already wrought much damage to the singular and beautiful petrifactions, commercial enterprise has been active in the exportation of specimens, and even the residents of the country who do not try to make money out of the "forest" seem also to be active in willful depredations. It is reported that, not long ago, a cow-boy rode his horse over the most remarkable petrified trunk, which forms a natural bridge above a ravine, in the mischievous hope that he might thus break it down. There are no settlers upon this tract of land, and therefore its reservation would not injure or even inconvenience any one, while it would preserve an array of natural curiosities which are unique of their kind and as interesting to the lover of the picturesque as to the scientific student.

For many years the boxes in which plug tobacco was packed in the United States were made of Sycamore lumber (Platanus), which, owing to its properties of great strength and freedom from all odor, made it the favorite wood for this purpose. It is now stated by *Hardwood*, however, that there is not enough Sycamore lumber manufactured in the United States to supply twenty-five per cent. of the plug tobacco boxes used annually, and that Gumwood, Liquidambar, is going to be the popular wood for this purpose, if it is not so already. Formerly the plugs were pressed by powerful machinery directly into the boxes, which therefore had to be made of some strong wood. Most manufacturers now, however, have iron or steel moulds into which the plugs are pressed into a body of exactly the size of the wooden boxes in which they are marketed. This plan allows the use of lighter boxes without cleats or corner-pieces; and many of these light boxes are now made from three thin layers of Gumwood, the middle layer being placed transversely to the other two and the whole solidly glued together under great pressure. Gum boxes made in this way are said to be substantial and durable. Rock maple and black birch are also used in some factories for tobacco boxes, but probably not to any great extent.

We have often spoken with regret of the wanton destruction of song-birds in this country, not only because their beauty and melody are a delight to all who live in the country, but because they are such important auxiliaries in the war against insects injurious to vegetation. This wholesale butchery is by no means confined to our own country. A recent number of the *Fortnightly Review* states that forty thousand larks daily come into the London markets, where poulterers sell them by the bushel. Besides those sold for table purposes, there are thousands killed for their feathers, their wings, when dyed so as to counterfeit tropical birds, being worn for ornaments. Large numbers are also trapped to let fly at shooting-matches, and many more are sold to be confined, not as household pets, but by gamblers, who, strangely enough, keep them and bet on their powers of song, although how such matches are decided one can hardly understand. All this makes agriculture and horticulture more difficult in England, where, under any circumstances, it is none too prosperous. But what seems surprising to Americans is that public sentiment in England will allow the extermination of a songster which seems to be such a favorite and holds so high a place in the poetical literature of the language.

A few boxes of grape-fruit from southern Florida and, perhaps, fifty barrels from Jamaica made up last week's supply for this city. The Jamaica output is nearly exhausted; much of this fruit now coming is of hybrid origin, and other, no less inferior, is gathered from old and neglected trees. This small thick-skinned fruit sold for $5.00 a barrel, while large specimens, with the fine quality of skin known in the trade as silky, readily brought $7.00 to $8.00 a barrel at wholesale, and the choicest from Florida commanded $10.00 a box. On Monday of this week a dozen barrels from Jamaica were eagerly bought up on the dock at $12.37 each, and owing to the scarcity and prevailing high prices so small a lot as two boxes was included in a large shipment of citrus fruits received from California on the same day. Grape-fruit has been known in this city only about twenty years, and so little was it appreciated fifteen years ago that some of each lot from the Bahamas was reshipped to England, where the prices, $7.00 to $8.00 a barrel, were double those obtained here for a very limited quantity. During the last five years the demand has increased rapidly, and each of the past few years has seen the supply doubled, until this season of scarcity due to the freezing of the trees in Florida last year.

In the recently published report of the Dean of Barnard College, in this city, which covers the year 1895, we read: "In view of the importance of her work, the responsibility she carries, and the learning and ability that enable her to bear it, the title of Professor of Botany has this year been conferred upon Dr. Gregory, with the approval of the President of Columbia College. Her department is doing its full share of university work, besides containing successful classes of special students and undergraduates. It has this year four candidates for the higher degrees and five for the Barnard Certificate. Its exhibit at the exposition of the Academy of Natural Sciences attracted much favorable attention. The department is one which has been of interest and usefulness to the community. But, though its progress is gratifying, it is also expensive. Professor Gregory reports that it is impossible to carry out our plans in regard to advanced work with our present equipment. A much-needed course in plant physiology, for instance, calls for materials and apparatus which are not at our command." The state of things which the Dean thus makes plain seems to offer a good opportunity for practical benevolence to some person of botanical tastes who is likewise interested in the higher education of women. Certainly there is no pursuit in which certain qualities which have always been considered characteristically feminine ought to make themselves felt to better advantage than in the higher branches of botanical research. We mean those qualities of patience, perseverance, careful attention to details, preciseness in observation and delicacy in manipulation which this branch of science conspicuously demands.